

Nonlinear Adaptive Filter for MEMS Gyro Error Cancellation

Completed Technology Project (2011 - 2012)



Project Introduction

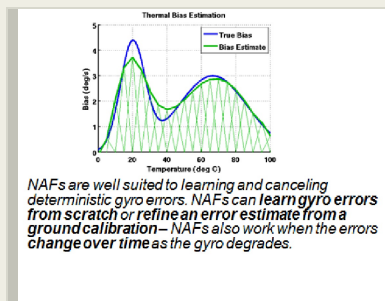
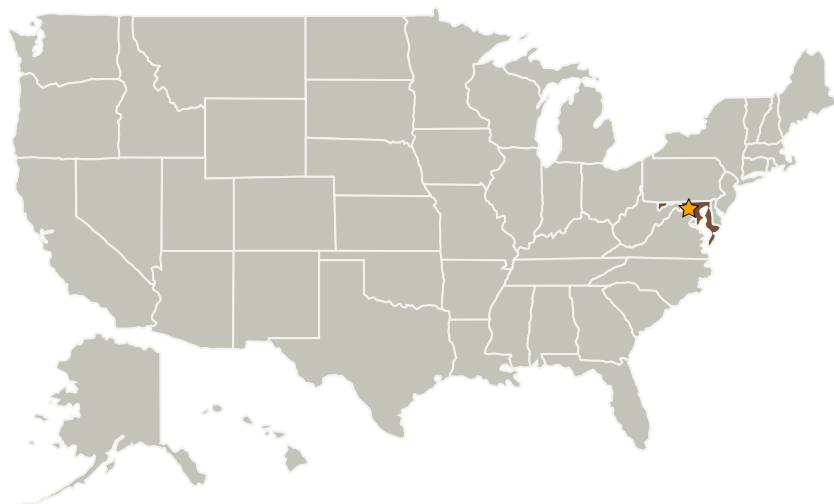
Thermal biases are the dominate error in low-cost low-power small MEMS gyros. CubeSats often can't afford the power/mass to put a heater on their MEMS gyros and don't have space for a higher-quality gyro. The Nonlinear Adaptive Filters (NAFs) enable precision pointing on CubeSats by eliminating thermal bias (and other) errors. NAFs are also beneficial to larger satellites with higher-quality gyros subjected to rapid thermal changes as NAFs eliminate thermal sensor errors.

The Nonlinear adaptive filters (NAF) can learn deterministic gyro errors and cancel the error's effect from attitude estimates. By completely canceling deterministic gyro errors, NAFs improve sensor performance. The project includes: Simulation of NAF (and comparison to state-of-art); Mathematical analysis to optimize NAF tuning; Development of high-fidelity gyro models, especially modeling thermal effects. Milestones include Simulation Development and Thermal Vacuum Testing with several CubeSat-grade gyros.

Anticipated Benefits

N/A

Primary U.S. Work Locations and Key Partners



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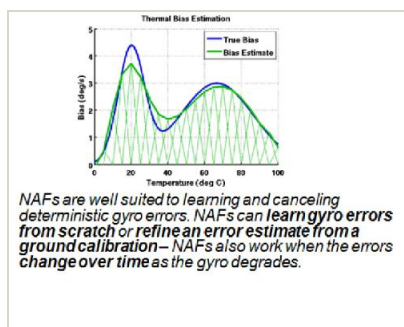
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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Images



47.jpg

Nonlinear Adaptive Filter for MEMS Gyro Error Cancellation
(<https://techport.nasa.gov/image/1269>)

Project Website:

<http://sciences.gsfc.nasa.gov/sed/>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Innovation Fund: GSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Peter M Hughes

Project Manager:

Timothy C Gehringer

Principal Investigator:

Joseph M Galante

Co-Investigators:

Scott R Starin
Scott E Heatwole

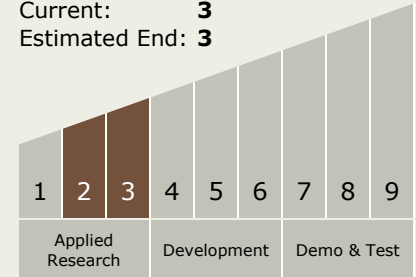
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Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.5 Thermal Control Analysis